DNV·GL

SOFTWARE

Allocation of Unidentified Gas Expert

Methodology Review

Tony Perchard & Andy Gordon

09 February 2018

Agenda

- Project overview
- Changes from previous year
- Methodology overview
  - Overall Unidentified Gas estimation
  - EUC/Product split
  - Conversion to factors
  - Directly estimated Unidentified Gas components
  - Balancing Factor
  - UIG factors
- Q&A

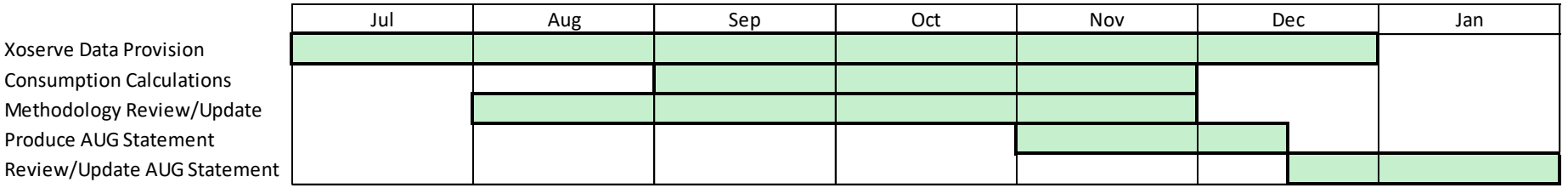
Project Overview

- AUG Expert appointed July 2016
- Pre-Nexus AUGE
  - RbD -> All Unidentified Gas initially allocated to SSP
  - Estimate total permanent Unidentified Gas
  - Split by LSP-SSP
- Post-Nexus AUG Expert
  - Calculate table of Weighting Factors to apportion UIG by EUC/Product Class
  - UIG is daily balancing figure

- UIG currently the focus of industry attention
  - Mods 642, 642A and 643

Project Timescales – Development of First Draft AUG Statement

- Kick-off Meeting – 25 July
- Data Specification – 9 Aug
- Quarterly Review – 6 Nov



Project Timescales

Key Dates - 2018	Description
01 February	First Draft AUG Statement published. Start of 42 day consultation period
09 February	Presentation of 1st draft AUG Statement
14 March	End of consultation period
Mid April	Industry Meeting to discuss responses
May	Industry Meeting to discuss Revised AUG Statement
May UNCC	Vote on AUG Statement
30 June	Publication of final AUG Table
July UNCC	Vote on AUG Table

Modifications Reviewed

- 0570 Obligation on Shippers to Provide at least One Valid Meter Reading per Meter Point into Settlement per Annum
- 0625 Extension from 6 Months to 10 Months for Transfer of Non-Mandatory Sites from Class 1
- 0631R Review of NDM Algorithm Post-Nexus
- 0632S Shipper Asset Details Reconciliation
- 0633V/0638V Mandate Monthly Read Submission for Smart and AMR Sites from 01 December 2017/01 April 2018
- 0634 Revised Estimation Process for DM Sites with D-7 Zero Consumption
- 0635 Reforms to Incentivise Accurate and Timely DM Reads to Improve the Accuracy of Unidentified Gas Allocation
- 642/642A/643 Changes to Settlement Regime to address Unidentified Gas Issues
- 644 Improvements to nomination and reconciliation through the introduction of new EUC bands and improvements in the CWV

Changes from Previous Year

- Shrinkage
  - Shrinkage Error
  - CSEP Shrinkage
- Post-Nexus data (actual Product Class)
- Meter read separation in Consumption Method
- TRAS data for Theft

Methodology Overview

- Evolving methodology
  - Year 1:
    - Only pre-Nexus data available
    - Similar methodology to previous years
    - Estimate Total Unidentified Gas & Split by EUC/Product class
  - Year 2:
    - Training data still comes entirely from pre-Nexus period
    - Actual Product Class data available
    - Not all Unidentified Gas comes from sources where Product Class is defined
  - Subsequent years:
    - Training data will extend into post-Nexus regime
    - Product Class *at the time* will be known

UIG Terminology

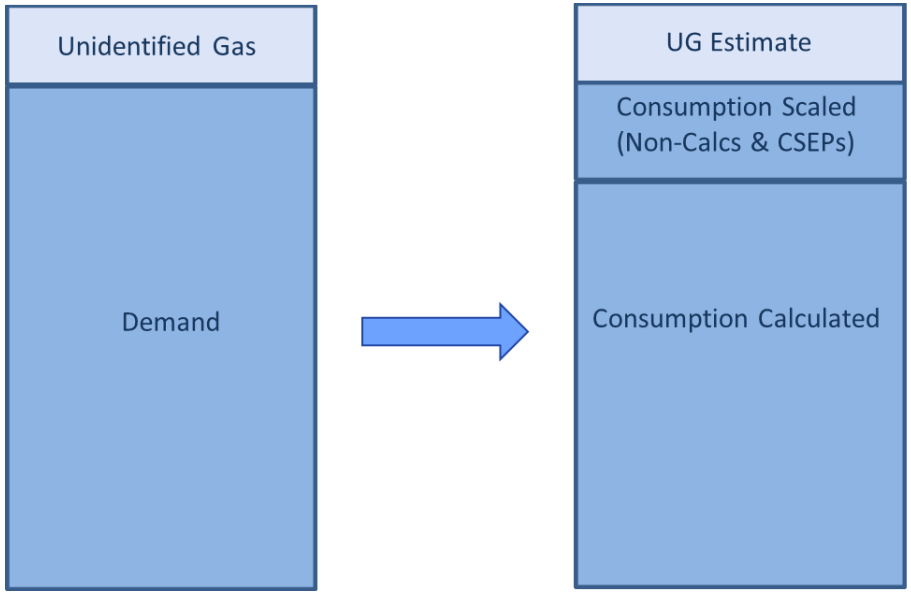
- Mod229 introduced Unidentified Gas
  - "UG" used by AUG Expert
- Nexus introduced UIG – daily balancing factor (TPD H2.6.1)

- UIG consists of Unidentified Gas plus Allocation Error
  - Calculated on the day and never recalculated
  - Hence UIG always contains Allocation Error

- At the point where all meters have been read
  - Allocation Error eliminated, so only Unidentified Gas remains
  - This is what the AUGE calculates as part of the methodology
  - Only exists in our calculations (because daily UIG is not recalculated)

Total Unidentified Gas Estimation

- Need estimate of Total Unidentified Gas to calculate factors (Consumption Method)
- Estimate Total Unidentified Gas = LDZ Input – Sum of Consumption for all MPRs
  - LDZ Input Metered
  - Consumption is estimated based on meter reads, AQ etc



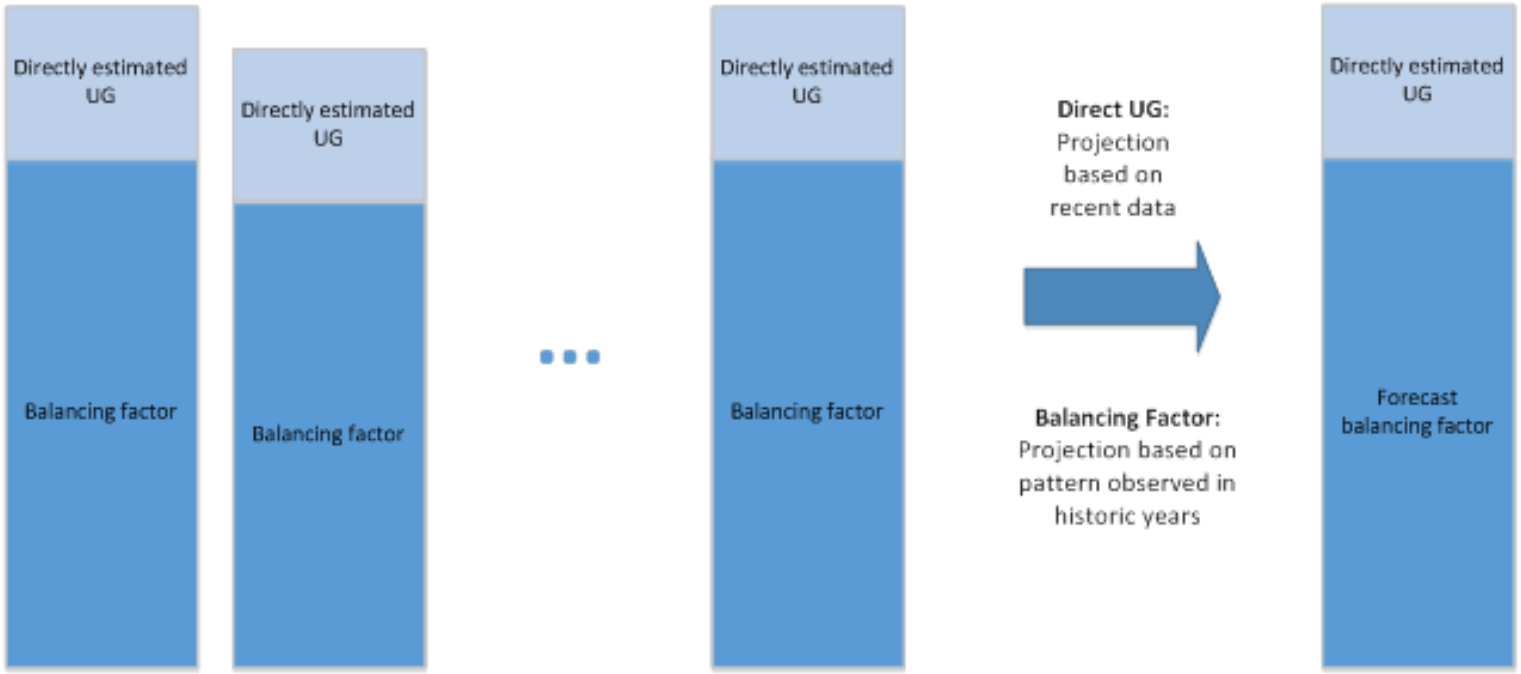
Consumption Method Changes

- Meter read separation
  - The start read is no more than 365 days from the start of the gas year (previously 540 days)
  - The end read is no more than 365 days from the end of the gas year (previously 540 days)
  - The distance between the two chosen meter readings is at least 160 days (previously 120 days)
  - The overlap between the metering period and the gas year is at least 90 days (previously 60 days)

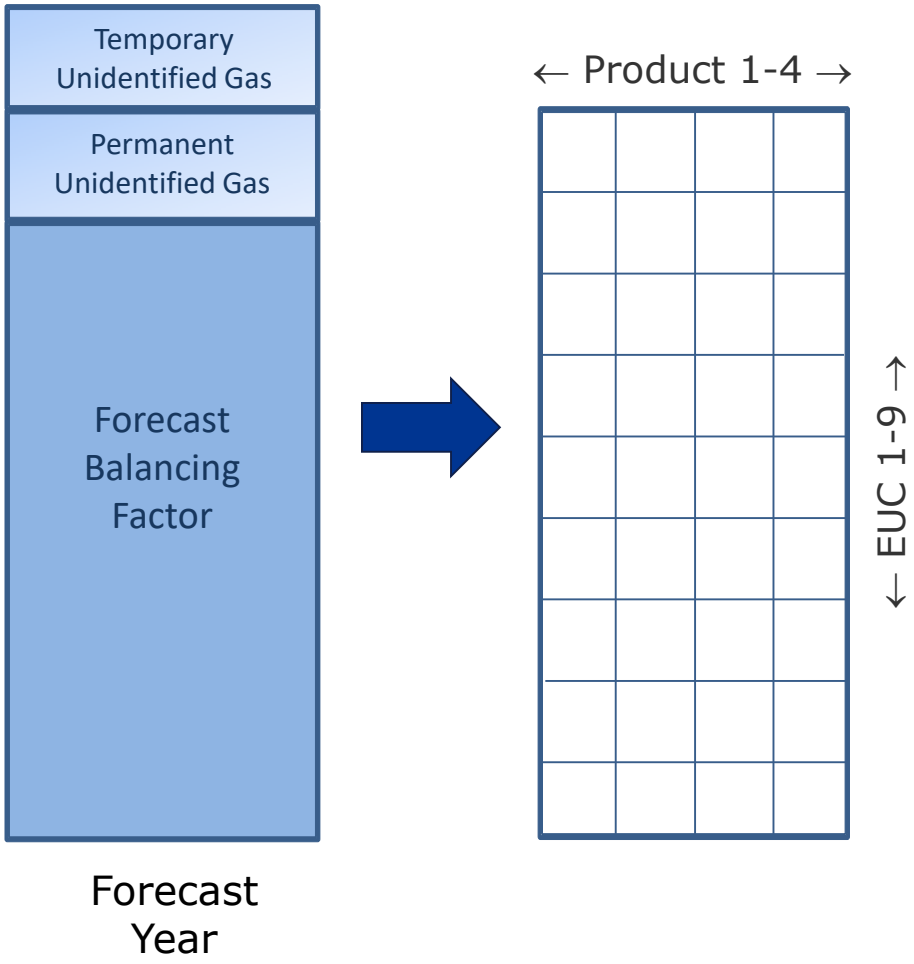
  - Calculation success rate ≈89% (previously ≈91%)
  - Effect on factors ≈0.01

Forecast Unidentified Gas

- Balancing Factor
  - BF = Total Unidentified Gas – Directly estimated Unidentified Gas
  - Projected forward using data up to 2015/16
- Directly estimated Unidentified Gas
  - Most recent data available



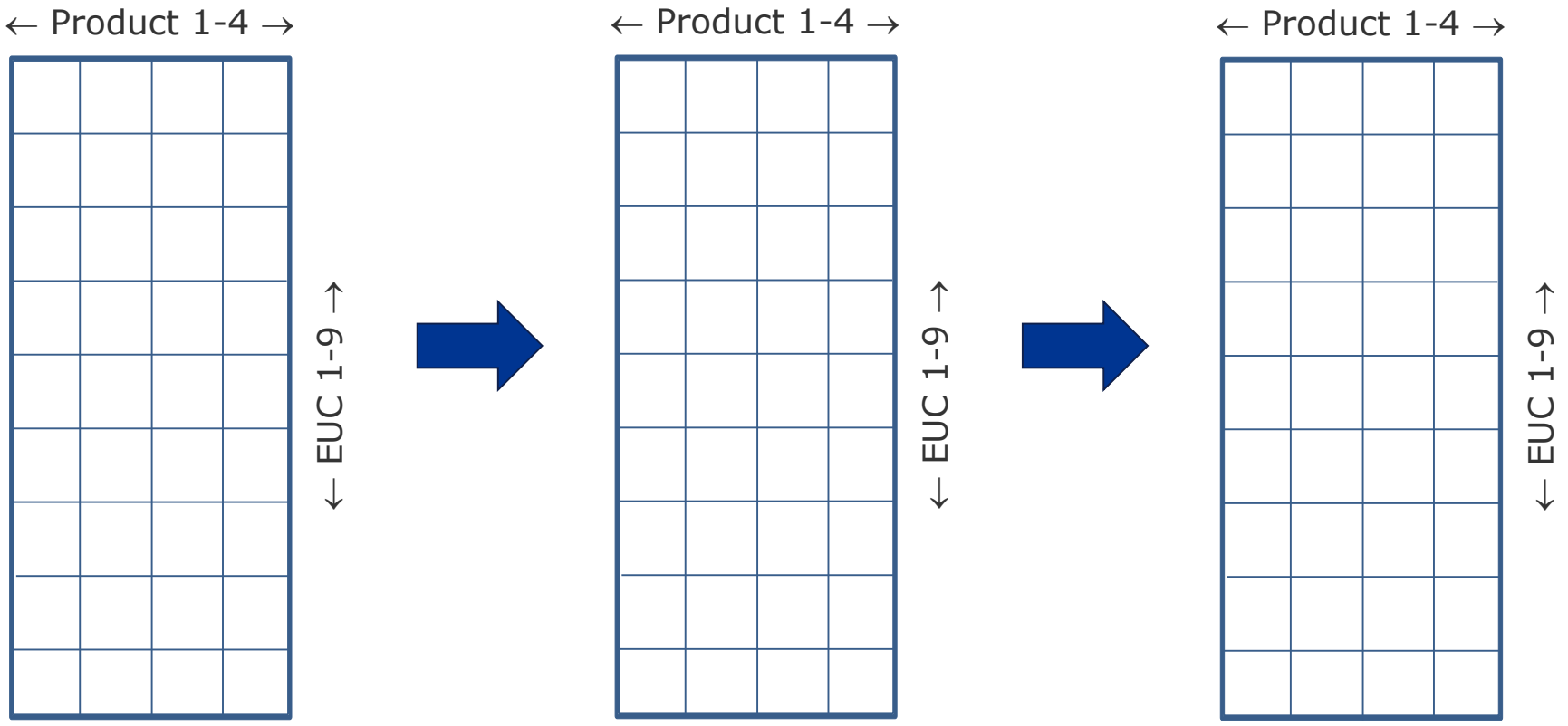
Forecast Unidentified Gas Components (GWh)



- Split of directly calculated Unidentified Gas categories is part of this calculation
- Balancing Factor is nearly all undetected theft
  - Split by throughput, amended for relative difficulty of stealing from different meter types and metering regimes
    - Smart meter, AMR, traditional meter
    - Daily meter readings, periodic meter readings

Energy → Factors

Energy (GWh) … divide by … **Throughput (TWh)** … gives … **Factors**



Population/Throughput Calculations

- Based on post-Nexus data for the first time
  - Actual Product Class data
- Xoserve have supplied data for two points in time
  - June 2017
  - Nov 2017
- Establish trends and extrapolate to October 2018
  - Full 36-way Product/EUC split
- Total Smart Meter population from Q3 2017 Smart Meter Report
  - Department for Business, Energy & Industrial Strategy
  - Extrapolate to October 2018 using current installation rates
  - Use to split Product Class 4 into Smart and traditional meters
  - All sites in EUCs 04B and above are required to have AMR

Population/Throughput Calculations

Market Sector	Smart Meter Population 30/09/2017	Quarterly Installation Rate	Smart Meter Population 30/09/2018	Smart Meter Percentage 30/09/2018
Domestic	3,522,690	516,264	5,587,746	26.6%
Non-Domestic	55,002	2,778	66,114	15.4%

- Domestic mapped to EUC 01B
- Non-Domestic mapped to EUCs 02B, 03B
- Quarterly data available from large suppliers only

Population Forecast by EUC and Product

1st October 2018

Number of Sites

	01B	02B	03B	04B	05B	06B	07B	08B	09B	Total
Product 1	15	35	17	41	66	196	187	219	282	1,058
Product 2	0	9	4	0	6	11	6	8	0	44
Product 3	53,974	3,270	1,643	90	1	0	0	0	0	58,978
Product 4	23,640,728	203,990	47,127	20,602	5,065	1,553	532	198	0	23,919,795
Total	23,694,717	207,304	48,791	20,733	5,138	1,760	725	425	282	23,979,875

Number of Sites (Percentage by EUC)

	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.02%	0.03%	0.20%	1.28%	11.14%	25.79%	51.53%	100.00%
Product 2	0.00%	0.00%	0.01%	0.00%	0.12%	0.63%	0.83%	1.88%	0.00%
Product 3	0.23%	1.58%	3.37%	0.43%	0.02%	0.00%	0.00%	0.00%	0.00%
Product 4	99.77%	98.40%	96.59%	99.37%	98.58%	88.24%	73.38%	46.59%	0.00%

Throughput Forecast by EUC and Product

1st October 2018

Aggregate AQ (GWh)

	01B	02B	03B	04B	05B	06B	07B	08B	09B	Total
Product 1	0	3	8	59	278	2,008	3,857	9,420	38,613	54,245
Product 2	0	2	2	0	24	143	130	292	0	593
Product 3	824	535	750	77	2	0	0	0	0	2,189
Product 4	319,713	27,921	21,311	24,667	17,213	13,935	10,718	7,917	0	443,395
Total	320,537	28,461	22,071	24,803	17,516	16,086	14,705	17,629	38,613	500,423

Aggregate AQ (Percentage of Total)

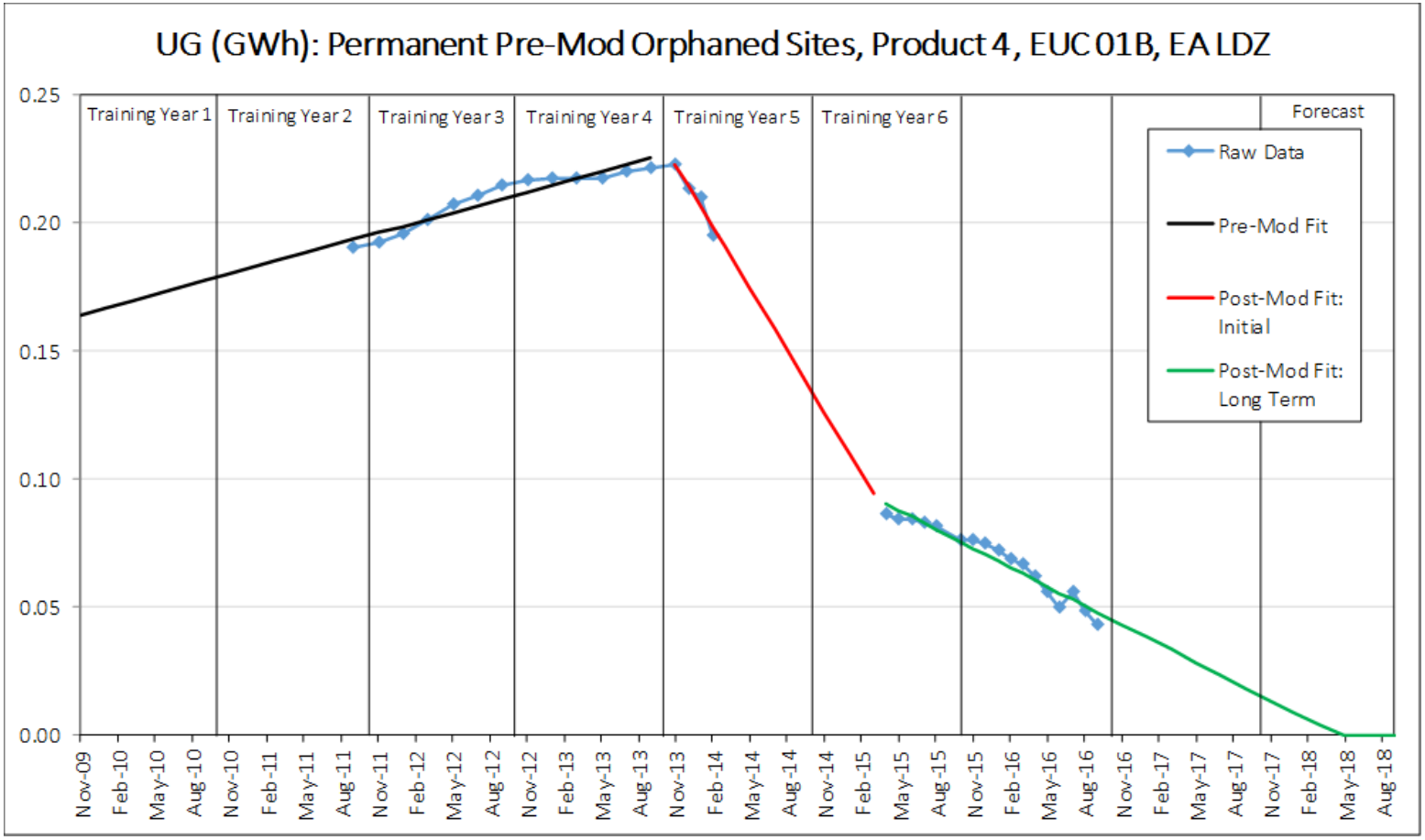
	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.00%	0.00%	0.01%	0.06%	0.40%	0.77%	1.88%	7.72%
Product 2	0.00%	0.00%	0.00%	0.00%	0.00%	0.03%	0.03%	0.06%	0.00%
Product 3	0.16%	0.11%	0.15%	0.02%	0.00%	0.00%	0.00%	0.00%	0.00%
Product 4	63.89%	5.58%	4.26%	4.93%	3.44%	2.78%	2.14%	1.58%	0.00%

Shipperless/Unregistered Sites

- Snapshots Sep 2011 – Sep 2017
- EUC from AQ (supplied in snapshots)
- Split as appropriate for
  - Pre/post Mod 410A (using Effective Date)
  - Pre/post Mod 424 (using Isolation Date)
  - Pre/post Mod 425 (using Isolation Date)
- Split between Temporary and Permanent using existing rules
- Split between Products for each EUC
  - These sites do not have a defined Product Class
  - Therefore split using tables in previous slides
- Trend over time → extrapolate to forecast year

Shipperless/Unregistered Sites – Example Trend

- Each trend needs to be constructed using a piecewise approach
- Effects of relevant Mod over time



Shipperless/Unregistered Sites

- All relevant Mods well established
  - Latest is Mod 425, effective from 01/04/2014
- Effects can be tracked with the set of snapshots available
  - Construct piecewise trends
- Split each Unidentified Gas category into
  - Pre- and post-Mod sites
  - Permanent/Temporary
  - LDZ
  - EUC
  - Product Class
- 1872 trends for each main Shipperless/Unregistered Unidentified Gas category

iGT CSEPs

- Snapshots Jan 2015 – Jun 2017 (Unknown Projects)
- Unregistered sites on known CSEPs
- Registered sites on known CSEPs

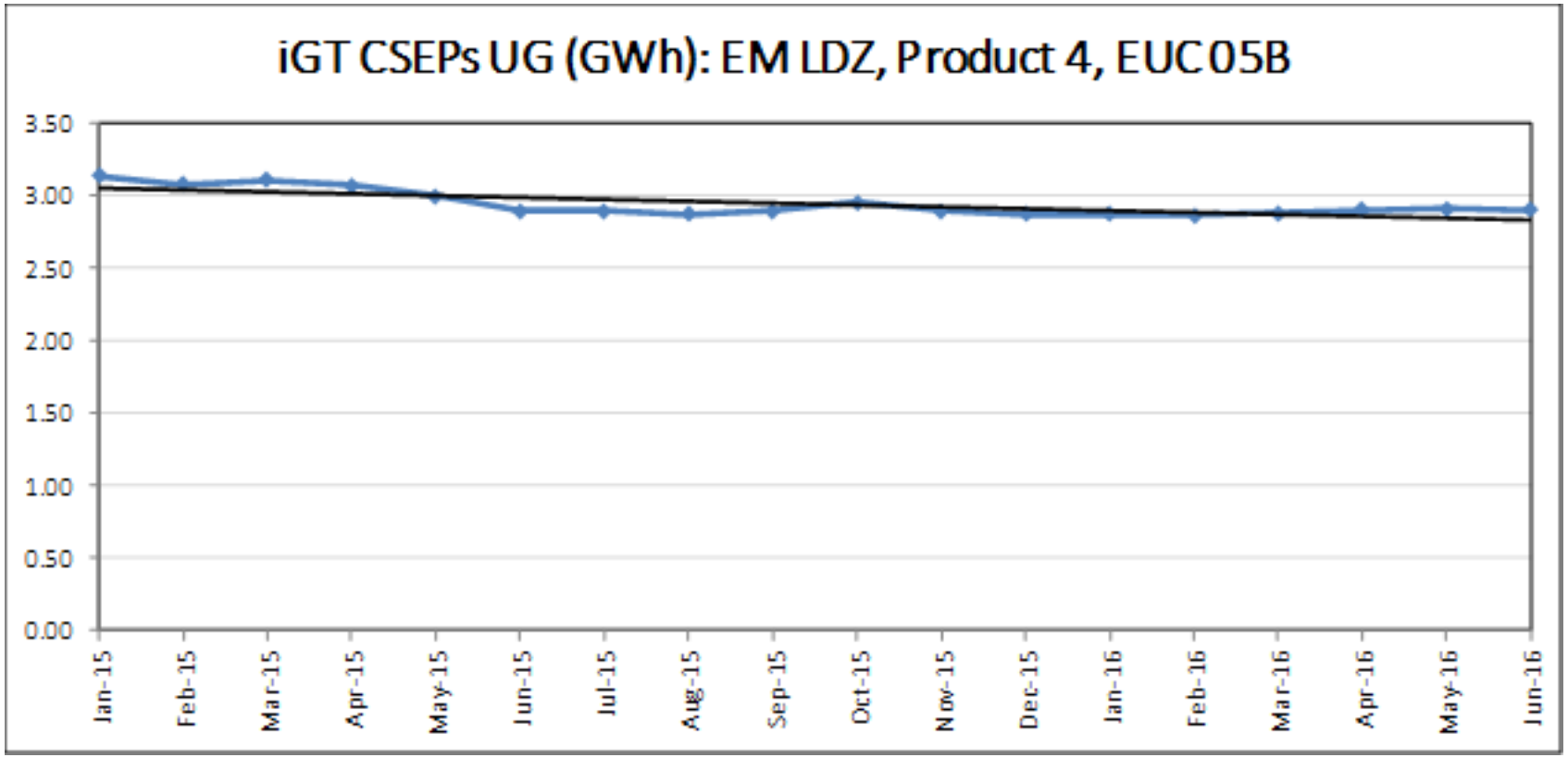
- EUC split taken from Registered sites on known CSEPs
  - Applied to Unknown Projects
- Add Unidentified Gas from Unregistered sites on known CSEPs

- Split between Product Class for each EUC
  - Site-by-site information not available for CSEPs
  - Therefore split using tables in previous slides

- Split between Temporary and Permanent using existing rules
- Trend over time → extrapolate to forecast year

iGT CSEPs – Example Trend

Example from EM LDZ – one of 468 trends for iGT CSEPs Unidentified Gas



Consumer Meter Errors

- Meter capacity report

- Identify meters operating at extremes of their range
- Use AQ and Meter Capacity from report
  - Under 1% of capacity → under-read
  - Over 95% of capacity → over-read

- EUC from AQ
- Look up Product Class from asset data

Consumer Meter Errors

- Calculate net over/under read for each EUC/Product Class combination
- Unidentified Gas from this source all Permanent
- Data limited to one snapshot per year
  - Any trends in data very limited
  - Currently assume process is steady over training period and forecast period
  - Trends are calculated and option exists to include them if they become significant

Shrinkage

- Shrinkage Error
  - The AUGE Framework has been updated to exclude this from the Unidentified Gas analysis

- CSEP Shrinkage
  - No CSEP Shrinkage element in the current settlement process
  - Feeds into UIG and hence included in the Unidentified Gas analysis
  - Imperial College estimate is that CSEP Shrinkage is ≈3.5% of total Shrinkage
  - Permission recently received from DNs to use their data to make our own independent estimate
  - Results in further Unidentified Gas in all EUC/Product Classes, including Product 1 and EUC 09B

CSEP Shrinkage Calculation

- Data from DNs
  - Mains populations and number of customers (aggregate LP)
  - Network models (Cadent)
    - Mains populations and number of customers by network

- Estimate of mains length per customer
  - Networks with similar composition to CSEPs
    - Small, non-rural, heavily domestic
  - Sense check using aggregate data from other DNs

- Use CSEP customer numbers to estimate mains length
- Leakage rates from NLT used to estimate leakage
  - Assume CSEPs are all PE

Theft

- Undetected Theft is the main component of the Balancing Factor

- Historic detected Theft affects the total Unidentified Gas calculation for the training period

- Theft data for full training period available
- Required as aggregate figure for each LDZ only
  - Individual figures for each training year

- Most Unidentified Gas from detected Theft is temporary
  - When it is detected within reconciliation period
  - Unidentified Gas from Thefts detected later than this goes into Balancing Factor

- Feeds into Consumption Method calculation for total Unidentified Gas

Theft Data

- Data from Xoserve records is detailed but incomplete
  - Includes vital fields for theft Unidentified Gas calculation
  - Does not include all thefts
- Data from annual Theft of Gas report is at a summary level but is more complete
  - This data shows that more thefts were actually billed each year than were reported to Xoserve by the Shippers
- GWh stolen per year calculated using Xoserve data and scaled to Theft of Gas report total level
  - Each theft can be assigned to a Product Class directly, but data is only required at an aggregate level for this analysis

Balancing Factor Split

- Mainly undetected theft
- Split based on throughput for site categories that can be subject to theft
  - Product Class 1 and EUC 09B excluded

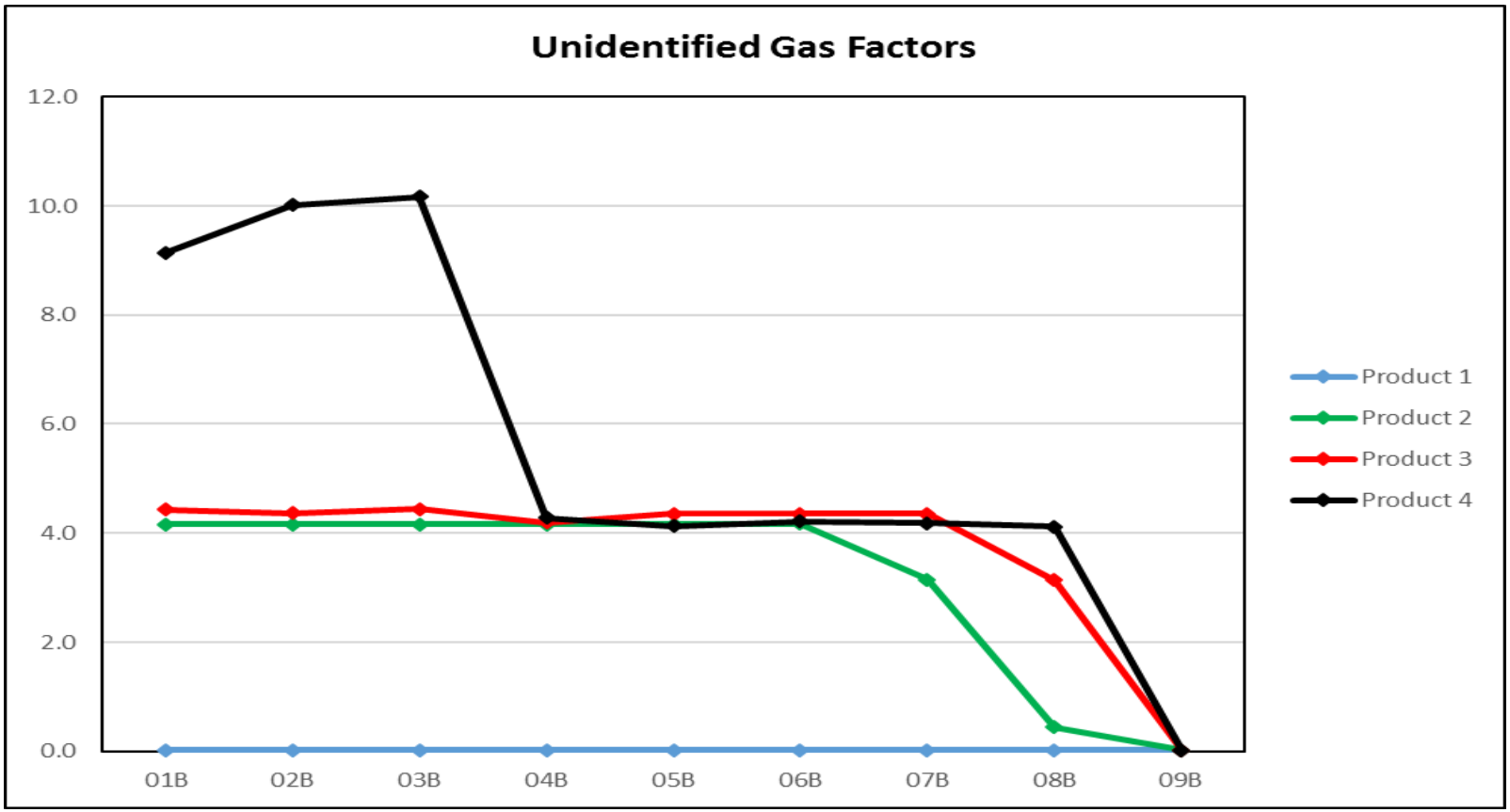
- High limit: Smart Meters and AMRs have the same theft levels as other meters
- Low limit: Smart Meters and AMRs have no undetected theft
- Best estimate – midpoint

	01B	02B	03B	04B	05B	06B	07B	08B	09B
Product 1	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Product 2	0.00%	0.00%	0.00%	0.00%	0.00%	0.02%	0.01%	0.03%	0.00%
Product 3	0.09%	0.06%	0.08%	0.01%	0.00%	0.00%	0.00%	0.00%	0.00%
Product 4	78.15%	7.45%	5.75%	2.76%	1.93%	1.56%	1.20%	0.89%	0.00%

Unidentified Gas Factors

Supply Meter Point Classification	Class 1	Class 2	Class 3	Class 4
EUC Band 1	0.02	4.16	4.44	9.14
EUC Band 2	0.02	4.16	4.37	10.02
EUC Band 3	0.02	4.16	4.44	10.17
EUC Band 4	0.02	4.16	4.19	4.28
EUC Band 5	0.02	4.16	4.36	4.13
EUC Band 6	0.02	4.17	4.36	4.21
EUC Band 7	0.02	3.15	4.36	4.18
EUC Band 8	0.02	0.45	3.14	4.11
EUC Band 9	0.02	0.02	0.02	0.02

Unidentified Gas Factors



Thank you

AUGE.software@dnvgl.com

www.dnvgl.com

SAFER, SMARTER, GREENER